

ABSTRACT OF THE DISCLOSURE

A cold electron emitter may include a heavily p-doped semiconductor, and dielectric layer, and a metallic layer (p-D-M structure). A modification of this structure includes a heavily n+ doped region below the p region (n+-p-D-M structure). These structures make it possible to combine high current emission with stable (durable) operation. The high current density is possible since under certain voltage drop across the dielectric layer, effective negative electron affinity is realized for the quasi-equilibrium "cold" electrons accumulated in the depletion layer in the p-region next to the dielectric layer. These electrons are generated as a result of the avalanche in the p-D-M structure or injection processes in the n+-p-D-M structure. These emitters are stable since they make use of relatively low extracting field in the vacuum region and are not affected by contamination and absorption from accelerated ions. In addition, the structures may be fabricated with current state-of-the-art technology.